

APOLLO

Proton transfer reactions

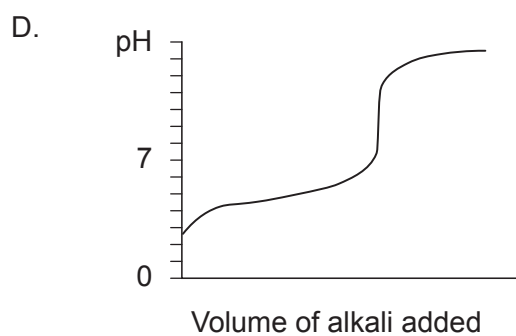
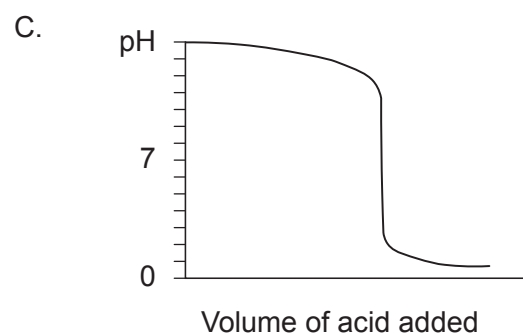
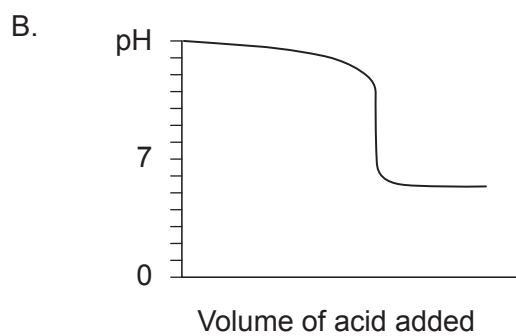
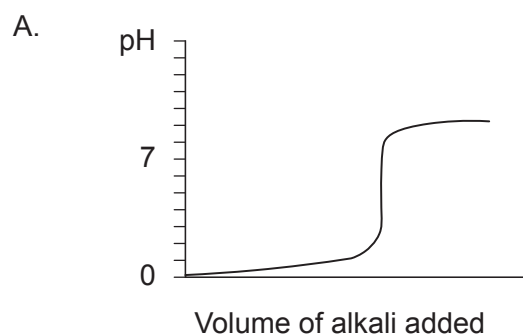
HL

Chemistry

First assessment 2025

20 questions | questions

3. Which chart shows the neutralization curve of a strong base with a strong acid?



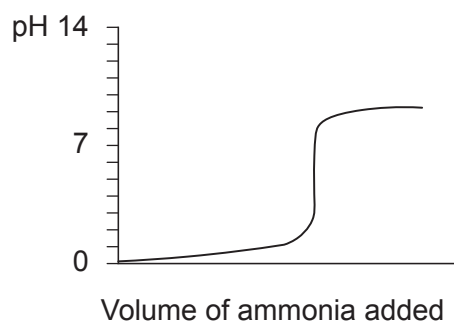
32. Which two species can be both Brønsted-Lowry acids and Brønsted-Lowry bases?

- A. H_3PO_4 and PO_4^{3-} .
- B. HPO_4^{2-} and H_2PO_4^- .
- C. HPO_4^{2-} and PO_4^{3-} .
- D. PO_4^{3-} and H_2PO_4^- .

33. A solution has a pH of 3.0. What is the hydroxide ion concentration, $[\text{OH}^-]$, in the solution?

- A. 11
- B. 10^{-3}
- C. 10
- D. 10^{-11}

39. When an excess of ammonia was added to hydrochloric acid, the following neutralization curve was obtained.



Which would be the best indicator for this titration?

	Indicator	pK_a
A.	Phenol red	7.9
B.	Bromothymol blue	7.0
C.	Phenolphthalein	9.6
D.	Bromocresol green	4.7

31. What is required to convert a base into its conjugate acid?

- A. A negative charge
- B. A hydrogen atom
- C. An electron pair
- D. A proton

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2225-0210

32. Which solution has a pH of 9.0?

- A. $10^{-9} \text{ mol dm}^{-3} \text{ NH}_3(\text{aq})$
- B. $10^{-9} \text{ mol dm}^{-3} \text{ NaOH}(\text{aq})$
- C. $10^{-5} \text{ mol dm}^{-3} \text{ NH}_3(\text{aq})$
- D. $10^{-5} \text{ mol dm}^{-3} \text{ NaOH}(\text{aq})$

- 33.** What is the main reason why sulfuric acid has a lower pH than methanoic acid of the same concentration?
- A. Sulfuric acid is diprotic, whereas methanoic acid is monoprotic.
 - B. Sulfuric acid ionizes more than methanoic acid.
 - C. Sulfuric acid has a stronger conjugate base than methanoic acid.
 - D. Sulfuric acid is more soluble in water than methanoic acid.

34. Which salt is basic?

- A. HCOONa
- B. HCOONH_4
- C. NaNO_3
- D. NH_4Cl

- 35.** What is the best indicator to use in the titration of phenylamine with nitric acid?
- A. Bromophenol blue, $pK_a = 4.2$
 - B. Bromothymol blue, $pK_a = 7.0$
 - C. Phenol red, $pK_a = 7.9$
 - D. Phenolphthalein, $pK_a = 9.6$

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Turn over

4445-0210

31. What is the pH of $0.0010 \text{ mol dm}^{-3} \text{ HCl(aq)}$?

- A. 2.0
- B. 2.5
- C. 3.0
- D. 3.5

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Turn over
4449-0219

32. Which solution is acidic at 25 °C?

- A. $[\text{H}^+] = 1.0 \times 10^{-9} \text{ mol dm}^{-3}$
- B. $[\text{OH}^-] = 1.0 \times 10^{-13} \text{ mol dm}^{-3}$
- C. $[\text{OH}^-] = 1.0 \times 10^{-6} \text{ mol dm}^{-3}$
- D. $[\text{H}_3\text{O}^+] = 1.0 \times 10^{-13} \text{ mol dm}^{-3}$

34. Which of these bases has the strongest conjugate acid?

Bases	K_b	pK_b
NH_3	1.8×10^{-5}	
CH_3NH_2		3.35
$(\text{CH}_3)_2\text{NH}$	5.9×10^{-4}	
CH_3CONH_2		14.5

- A. NH_3
- B. CH_3NH_2
- C. $(\text{CH}_3)_2\text{NH}$
- D. CH_3CONH_2

- 35.** What is the pH of a buffer solution which contains $0.500 \text{ mol dm}^{-3}$ of methanoic acid and $0.250 \text{ mol dm}^{-3}$ of sodium methanoate?

$\text{p}K_{\text{a}}$ (methanoic acid) = 3.75

- A. 3.25
- B. 3.45
- C. 3.75
- D. 4.05

32. In which of the following reactions does ammonia behave as a Brønsted–Lowry base?

- A. $4\text{NH}_3 + 5\text{O}_2 \rightarrow 4\text{NO} + 6\text{H}_2\text{O}$
- B. $\text{NH}_3 + \text{H}_2\text{O} + \text{CO}_2 \rightarrow (\text{NH}_4)\text{HCO}_3$
- C. $\text{NH}_3 + \text{CH}_3\text{CH}_2\text{Cl} \rightarrow \text{CH}_3\text{CH}_2\text{NH}_2 + \text{HCl}$
- D. $2\text{NH}_3 + 2\text{K} \rightarrow 2\text{KNH}_2 + \text{H}_2$

33. Which aqueous solution has the lowest pH?

- A. $0.01 \text{ mol dm}^{-3} \text{NH}_4\text{Cl}$
- B. $0.01 \text{ mol dm}^{-3} \text{NaCl}$
- C. $0.01 \text{ mol dm}^{-3} \text{NH}_4\text{HCO}_3$
- D. $0.01 \text{ mol dm}^{-3} \text{NaHCO}_3$

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0020-0207

31. What is the concentration of OH^- (aq), in mol dm^{-3} , in a solution at 298.15 K with a pH of 4.50?

$$\text{pH} = -\log_{10}[\text{H}^+] \quad [\text{H}^+] = 10^{-\text{pH}} \quad \text{pOH} = -\log_{10}[\text{OH}^-] \quad [\text{OH}^-] = 10^{-\text{pOH}} \quad K_w = [\text{H}^+][\text{OH}^-]$$

- A. 3.16×10^{-10}
- B. 3.16×10^{-9}
- C. 3.16×10^{-5}
- D. 3.16×10^{-4}

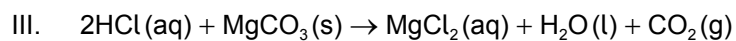
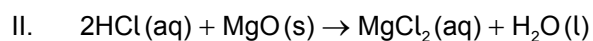
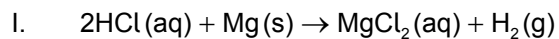
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0025-0219

32. Which aqueous solution has the lowest pH?

- A. $1.0 \text{ mol dm}^{-3} \text{ HNO}_3$
- B. $2.0 \text{ mol dm}^{-3} \text{ HCl}$
- C. $1.0 \text{ mol dm}^{-3} \text{ CH}_3\text{COOH}$
- D. $2.0 \text{ mol dm}^{-3} \text{ NaOH}$

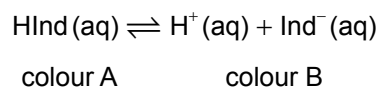
32. Which reactions involve the transfer of a proton?



- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

Turn over

33. The indicator, HInd, is used in an acid–base titration.



Which statements are correct?

- I. In a strongly alkaline solution, colour B is observed.
 - II. Colour A is observed when $[\text{HInd}] < [\text{Ind}^-]$.
 - III. $[\text{Ind}^-]$ approximately equals $[\text{HInd}]$ at the end point.
- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

37. Which term cannot characterize ammonia, NH_3 ?

- A. Lewis acid
- B. Brønsted–Lowry acid
- C. ligand
- D. nucleophile